SIMATIC HMI and OPC UA Part 5: WinCC Advanced RT Server, Comfort Panel Client

WinCC Advanced V14, Comfort Panel, WinCC Runtime Advanced

https://support.industry.siemens.com/cs/ww/en/view/63481236

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Table of Contents

1 Task

Introduction

The application example describes the configuration steps for creating a secure OPC UA connection (UA Security)[1] between a SIMATIC Comfort Panel and WinCC Runtime Advanced (PC station).

Overview of the automation task

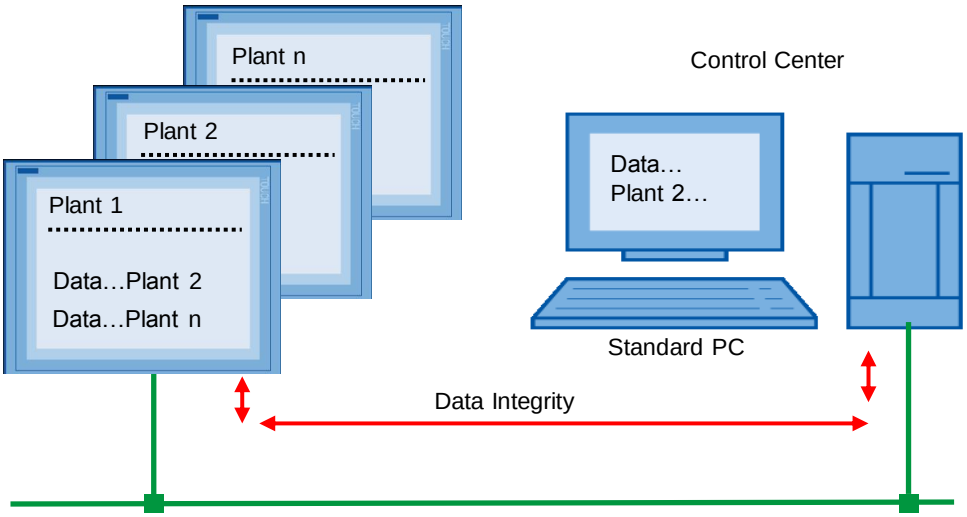
A production plant consists of several plant areas. In each plant area, an HMI operator panel is used to control a machine.
A control center summarizes the information of the individual plant areas and outputs it using a PC station.

The HMI operator panels from the plant areas additionally allow the user to output cross-plant information. The HMI operator panel receives the information directly from the PC station in the control center.

For security reasons, communication between the HMI operator panel and the PC station must be encrypted.

The following figure provides an overview of the automation task.

Figure 1-1



[1] UA Security consists of authentication and authorization, encryption and data integrity via signatures.

2 Solution

Overview

SIMATIC Comfort Panels are used to control the plant areas. A PC station with WinCC Runtime Advanced installed on it is used in the control center.

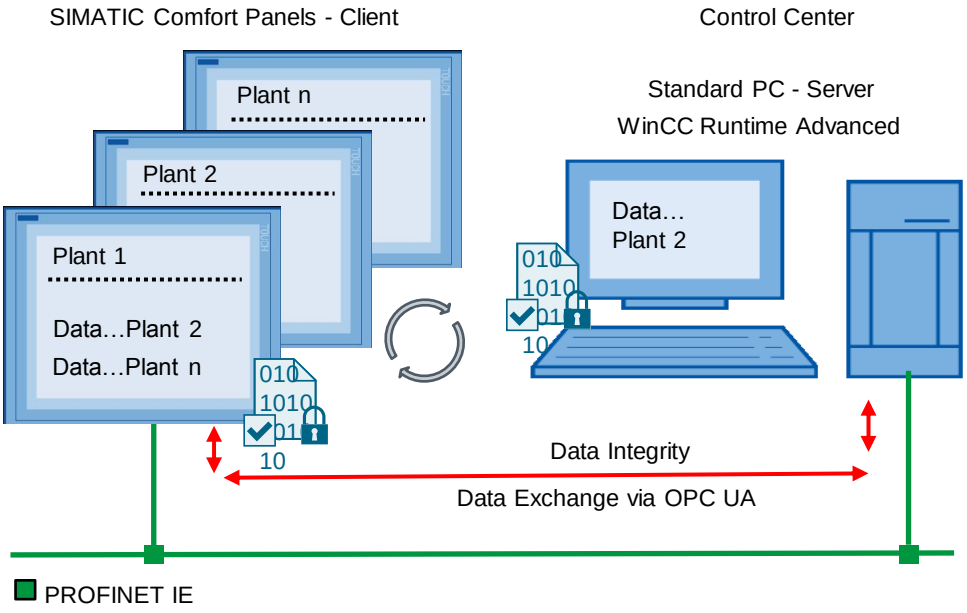
- The Comfort Panels are parameterized as an OPC UA client.
- The PC station is parameterized as an OPC UA server.
- All devices communicate via the OPC UA interface. Data integrity through encryption and digital signatures is supported by the OPC UA communication interface.

Note When the application example uses the term ‘PC station’, this always refers to the "WinCC Runtime Advanced” installation.

Diagrammatic representation

The diagrammatic representation below shows the most important components of the solution:

Figure 2-1



Configuration

All nodes are integrated into a PROFINET network. The nodes communicate with each other via the OPC UA interface.

The following devices are used as hardware:

- SIMATIC HMI TP900 Comfort Panels
- Standard PC with WinCC Runtime Advanced V14

2.1 Hardware and software components

2.1.1 Validity

The application example is valid for:

- WinCC Runtime Advanced V14 or higher.
- All Comfort Panels.

2.1.2 Components used

The application example was created with the following components:

Hardware components

Table 2-1

Component	No.	Article number	Note
SIMATIC HMI TP900 COMFORT	1	6AV2124-0JC01-0AX0	-
Standard PC	1	-	-
CPU 1516-3 PN/DP	1	6AG1516-3AN00-7AB0	Optional

Software components

Table 2-2

Component	No.	Article number	Note
SIMATIC WinCC Advanced V14	1	6AV2102-0AA03-0AA5	-
SIMATIC WinCC Runtime Advanced V14	1	6AV2104-0…-….	-

Sample files and projects

The following table contains the names of the sample files that are used in this application example.

Table 2-3

Component	Note
63481236_Part5_CODE_RT Advanced Server und Panel Client.zip	Contains the WinCC Advanced V14 project.
63481236_Part5_RT Advanced Server und Panel Client_en.pdf	This document.

3 Configuration and Project Engineering

General

A WinCC (TIA Portal) configuration is used as a basis for this application example. The configuration includes

- a PC station with a WinCC Runtime Advanced station.
- a TP900 Comfort Panel.
- a CPU 1516-3 PN/DP.

Based on this hardware configuration, the following sections describe all the settings that are required for data exchange via the OPC UA interface.

STEP 7 configuration

The application example includes a SIMATIC S7-1516 3PN/DP.

The controller is optional and shows that all HMI tags (with and without a PLC connection) can be accessed via the OPC UA interface.

This application example does not provide a detailed description of how to create a connection to the controller.

Comfort Panel

The starting point is an existing WinCC (TIA Portal) project with a SIMATIC TP900 Comfort Panel.

PC station

The starting point is an existing WinCC (TIA Portal) project with a WinCC Runtime Advanced station.

Note When the application example uses the term ‘PC station’, this always refers to the "WinCC Runtime Advanced configuration” settings.

IP addresses

Define the IP addresses for the individual hardware components. The following table shows the IP addresses used in the sample project:

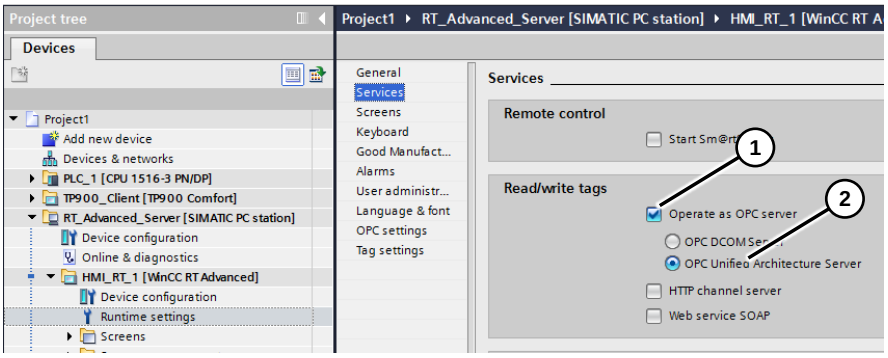
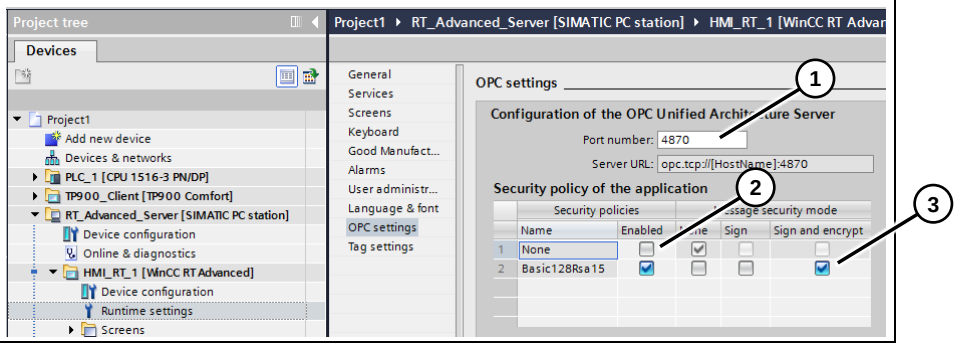
Table 3-1

Hardware	IP address	Subnet
SIMATIC HMI TP900 Comfort Panel	172.16.34.210	255.255.0.0
WinCC Runtime Advanced (PC station)	172.16.34.5	255.255.0.0
CPU 1516-3PN/DP	172.16.34.34	255.255.0.0

3.1 PC station configuration – server

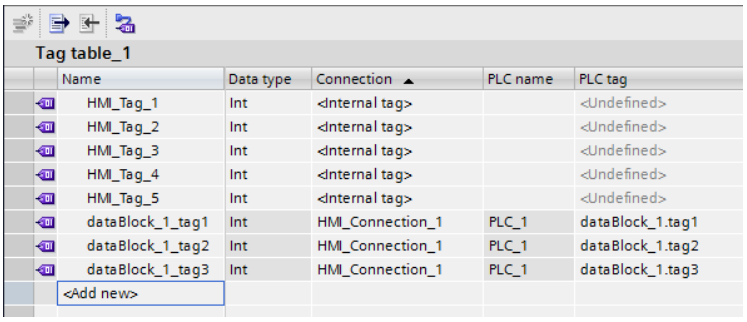
3.1.1 OPC UA configuration

Table 3-2

No.	Action
1.	**Enabling OPC UA** • In the project tree, select the PC station and open "Runtime settings". • Select the "Services" menu item. "Project tree > Runtime settings > Services". • In the "Read/write tags" section, check the "Operate as OPC server" check box (1). • Check the "OPC UA Server" check box (2). 
2.	**OPC settings** • In "Runtime settings", open the "OPC settings" menu (Project tree > Runtime settings > OPC settings). • Specify the port number. You can specify a value between 1024 and 49151. The application example uses port number "4870" (1). • In "Security policy of the application", uncheck the "None" check box in the "Security policies" table column (2). This enables the encryption. • In the second row, specify the encryption type. The application example uses the default setting,"Basic128Rsa15" and "Sign and encrypt", (3). 

3.1.2 Creating tags

Table 3-3

No.	Action
1.	Insert all required tags. You can use internal HMI tags and tags with a PLC connection. Five internal tags and three tags with a PLC connection were created for the application example. The application example does not provide a detailed description of how to create a tag. 

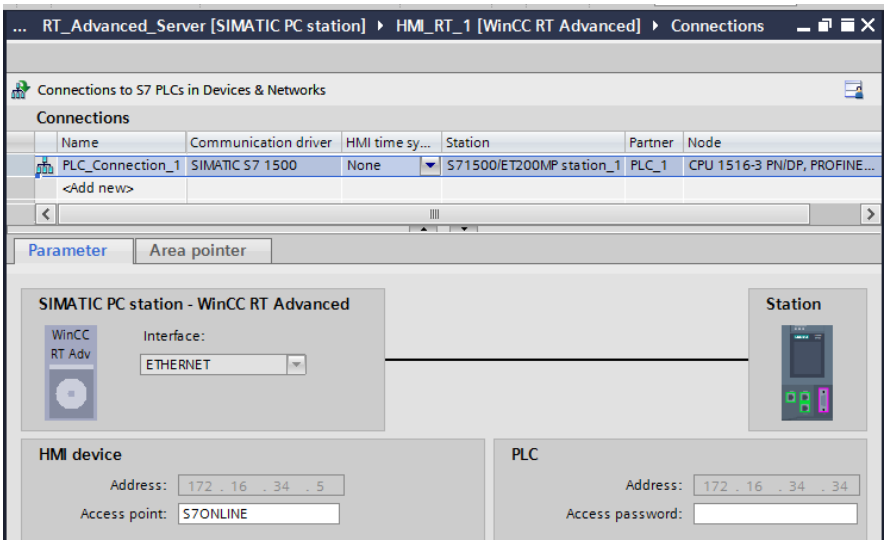
Tag table_1

Name	Data type	Connection	PLC name	PLC tag
HMI_Tag_1	Int	<Internal tag>		<Undefined>
HMI_Tag_2	Int	<Internal tag>		<Undefined>
HMI_Tag_3	Int	<Internal tag>		<Undefined>
HMI_Tag_4	Int	<Internal tag>		<Undefined>
HMI_Tag_5	Int	<Internal tag>		<Undefined>
dataBlock_1_tag1	Int	HMI_Connection_1	PLC_1	dataBlock_1.tag1
dataBlock_1_tag2	Int	HMI_Connection_1	PLC_1	dataBlock_1.tag2
dataBlock_1_tag3	Int	HMI_Connection_1	PLC_1	dataBlock_1.tag3
<Add new>				

3.1.3 Creating the connection

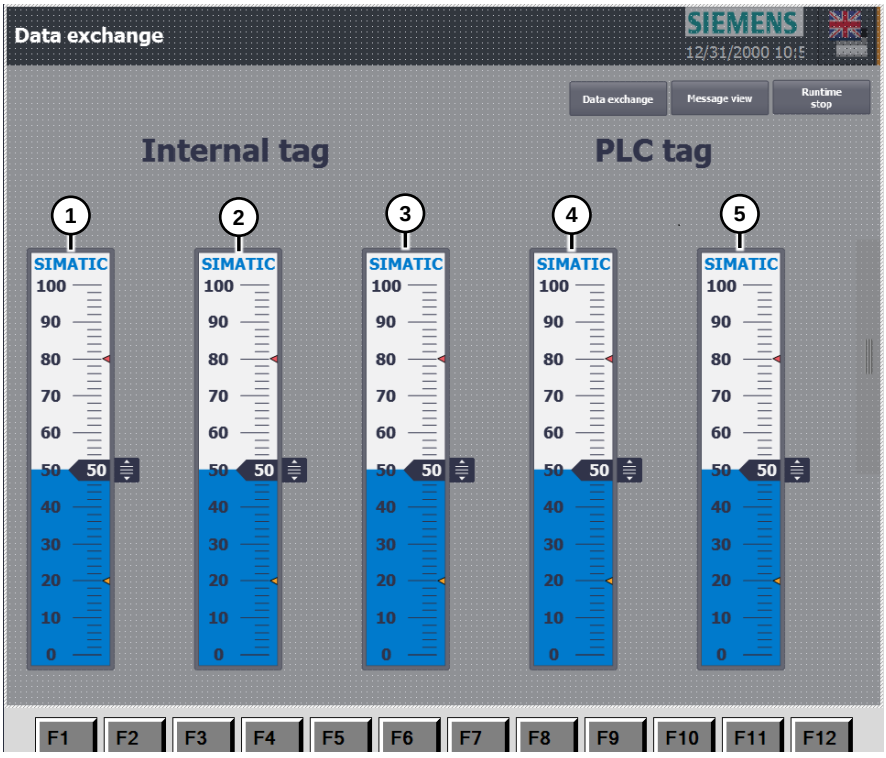
Table 3-4

No.	Action
1.	In the "Connections" menu, **no** OPC UA communication settings need to be made for the PC station. The required communication settings are made when configuring the "client" (see Chapter 3.2.1 "Creating the OPC UA connection").



3.1.4 Plant screen

Table 3-5

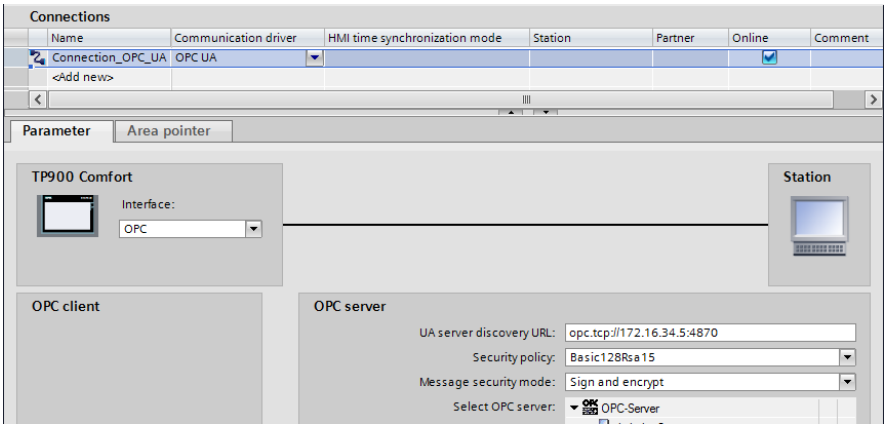
No.	Action
1.	The screen provides five sliders to test data exchange between the PC station and the TP900 Comfort Panel. The sliders allow you to simulate "process values”. The first three sliders each use an internal tag. Sliders 4 and 5 each use a tag with a PLC connection. 

3.2 TP900 Comfort Panel configuration – client

3.2.1 Creating the OPC UA connection

Table 3-6

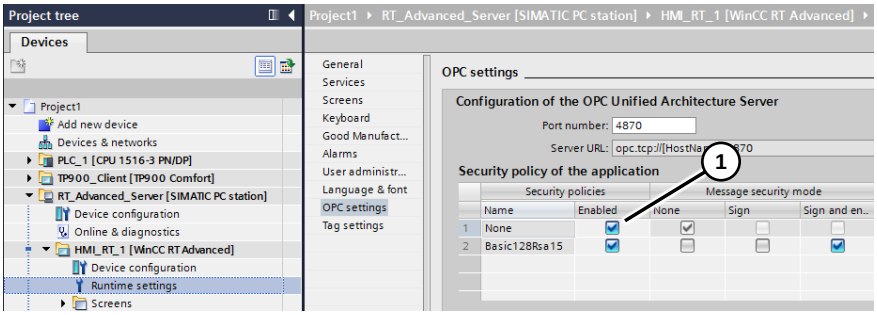
No.	Action
2.	**Creating the OPC UA connection** • In the project tree, open the "Connections" folder. • Create a new connection. • In "Communication driver", select "OPC UA". - "OPC server" (Specify the server's IP address. In this case: the PC station's IP address) UA server discovery URL: opc.tcp://172.16.34.05:4870 Security policy: Basic128Rsa15 Message security mode: Sign and encrypt. **Note:** The "security policy" used must match the "security policy" selected in the WinCC Runtime Advanced (server) configuration (see Chapter 3.1.1 "OPC UA configuration").

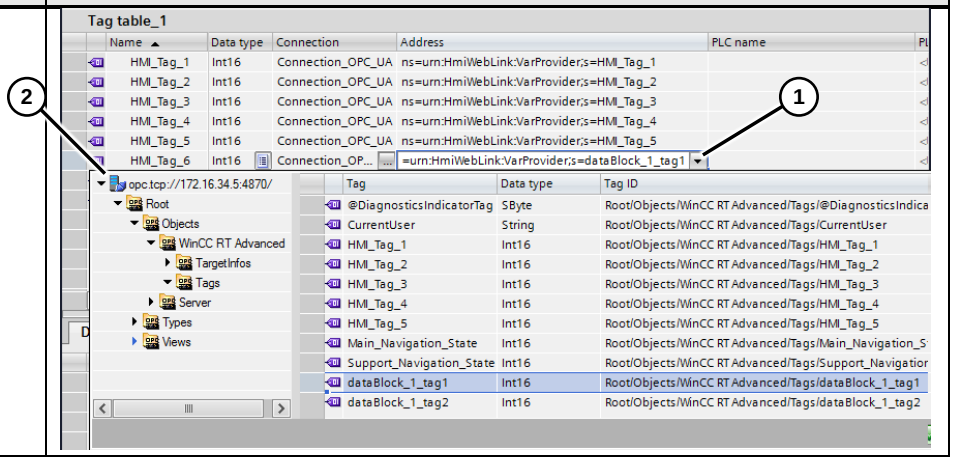


3.2.2 Online browsing to the PC station tags

From the TP900 Comfort Panel's tag editor, you can browse (online) to the tags of the PC station (server).

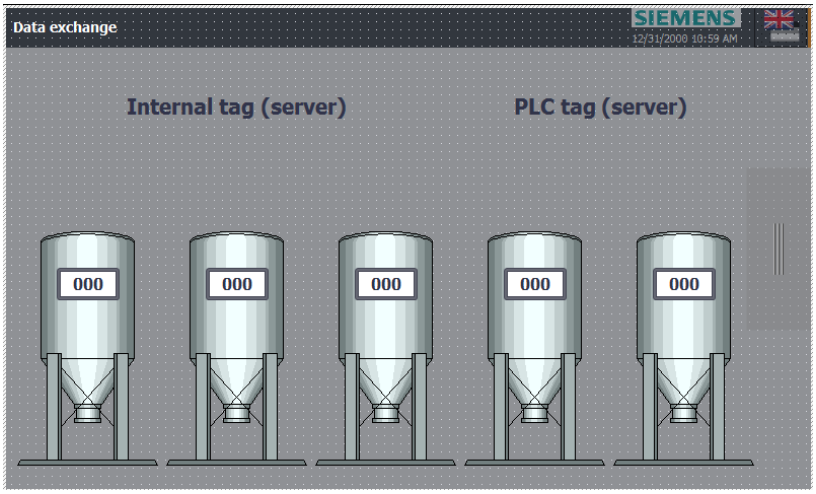
Table 3-7

No.	Action
1.	**Preparations in the PC station configuration** In order to browse to the PC station tags online, edit the "security policies" in the PC station configuration. • In the project tree, open the OPC settings for the PC station. "Project tree > Runtime settings > OPC settings". • For the period during which you browse to the TP900 Comfort Panel tags, check the "None" check box (1). • Transfer or start the PC station runtime. 
2.	**Adding tags** Precondition: The PC station runtime has started. • Open the TP900 Comfort Panel's tag editor. • Insert a new tag and in the "Address" column, open the drop-down list (1). A dialog opens (2). • In the dialog, click the arrow next to the "server object". • Navigate to the "Root > WinCC RT Advanced > Tags" folder. The folder displays the PC station's tags. **Note:** The path may differ depending on the project. • Double-clicking a single tag applies the tag to the TP900 Comfort Panel configuration.

No.	Action
	
3.	To add more tags, repeat the step from table section 2.
4.	**Enabling "security policies" in the PC station** • In the PC station project tree, open the OPC settings. "Project tree > Runtime settings > OPC settings". • Uncheck the "None" check box. Transfer or start the PC station runtime.

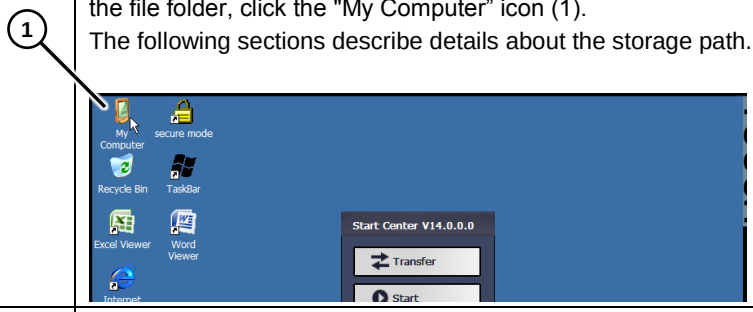
3.2.3 TP900 Comfort Panel plant screen

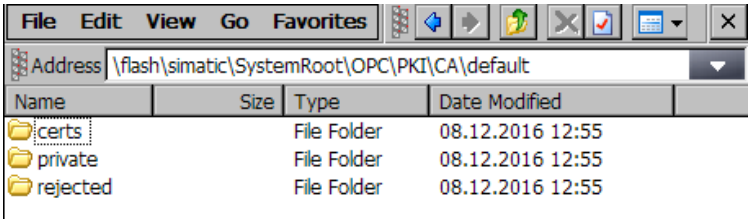
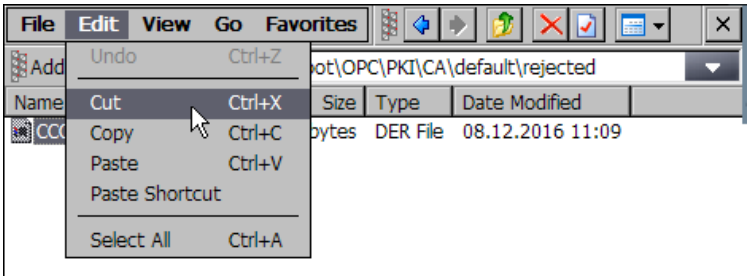
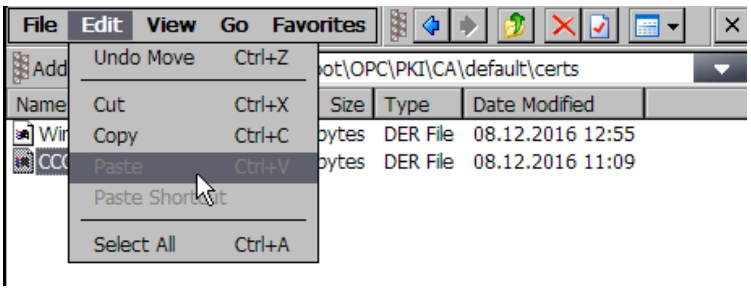
Table 3-8

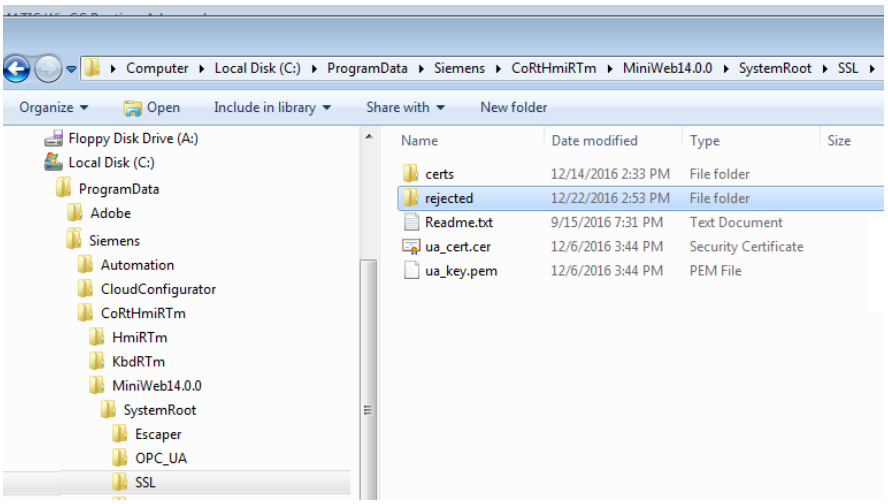
No.	Action
1.	For illustration purposes, the plant screen contains five symbolic containers to test data exchange between the TP900 Comfort Panel and the PC station. The tags that are output on this plant screen match the tags from Chapter 3.2.2 "Online browsing to the PC station tags". 

3.3 Handling the certificates

Table 3-9

No.	Action
1.	**General** • Make sure that the PC station is connected to the Comfort Panel. • Make sure that the date and time are synchronized on both devices. **Opening the file folder on the Comfort Panel** The certificates are stored in a special file folder in the Comfort Panel. To go to the file folder, click the "My Computer" icon (1). The following sections describe details about the storage path. 
2.	**Starting the PC runtime** • Start the PC station runtime.
3.	**Starting and stopping the Comfort Panel runtime** • Start the Comfort Panel "runtime". • Wait until the start screen appears on the Comfort Panel. • The PC station transfers its certificate to the Comfort Panel via the existing network connection. In the Comfort Panel, the certificate is saved to the "**rejected**" file folder. • Stop the Comfort Panel runtime.

No.	Action
4.	**Moving the TP900 Comfort Panel (client) certificate** In the TP900 Comfort Panel, navigate to the following directory: "My Computer\flash\simatic\SystemRoot\OPC\PKI\CA\default"  • Open the "rejected" folder and cut (do **not** copy) the "hexadecimal number..." certificate (Edit > Cut).  In the same folder tree, open the "**certs**" folder and paste the certificate you have just cut into this folder.  • Moving the certificate is now complete. Close the file system.
5.	**Starting the Comfort Panel runtime** • Start the Comfort Panel "runtime". • Wait until the Comfort Panel's start screen appears. • If you have stopped the PC station runtime, start it.

No.	Action
6.	**Moving the PC station (server) certificate** • On the PC station, navigate to the "**rejected**" Windows folder. "C:\ProgramData > Siemens > CoRtHmiRTm > MiniWeb14.0.0 > SystemRoot > SSL" **Note:** If the "ProgramData" folder is **not** displayed, check "Folder Options" on the installation drive (Tools > Folder Options…). In "Hidden files and folders", check "Show hidden files, folders and drives". • In the "rejected" folder, select the existing certificate and cut the certificate using the system function. • In the same folder tree, open the "**certs**" folder and paste the certificate you have just cut into this folder. **Note:** If the "rejected" folder contains multiple certificates, use the creation date to find the correct certificate. Moving the certificate is now complete. Close the file system. 
7.	**Checking the connection** If the certificates have been correctly assigned, the Comfort Panel establishes a connection to the PC station.

4 Installation and Startup

4.1 Installation

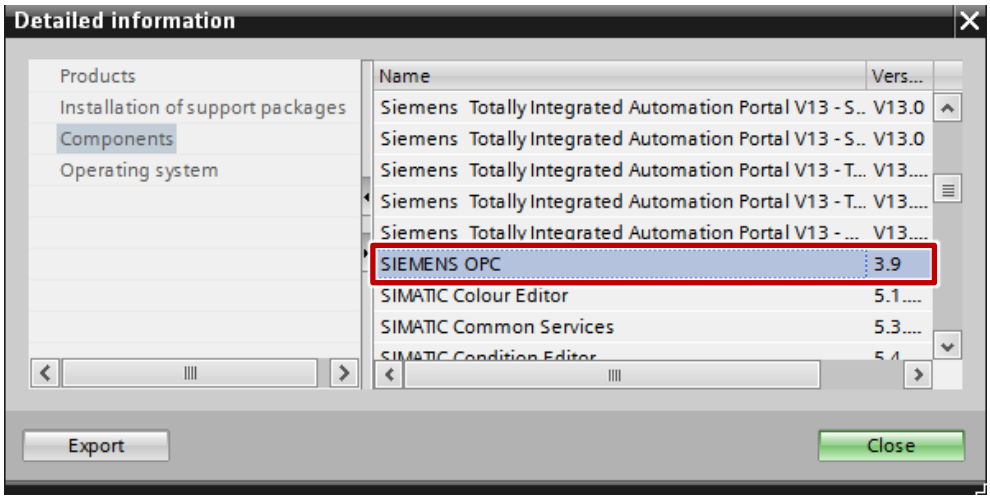
Requirement

- The software listed in Chapter 2.1 must be installed.
- For communication between the Comfort Panel and the WinCC Runtime Advanced station, the "SIEMENS OPC" option must be installed on the PC station.
  Make sure to enable the "SIEMENS OPC" option before installing WinCC Runtime Advanced. If necessary, you can install this option at a later time. To do this, insert the installation CD again and follow the instructions.

The online help allows you to check whether the "SIEMENS OPC" option is installed on the PC station: "**Help > Installed software… > Detailed information about installed software > Components**".

Online help view when the "SIEMENS OPC" option is installed.

Figure 4-1



4.2 Startup of the application example

Table 4-1

No.	Description
1.	Unzip the supplied application example to a folder and open the configuration.
2.	Make sure that all nodes are on and connected to each other.
3.	Transfer the configuration to the Comfort Panel and start the WinCC Runtime Advanced station runtime.
4.	For the next steps, see Chapter 3.3 "Handling the certificates". When you have copied the certificates, startup is complete.

5 Operation of the Application Example

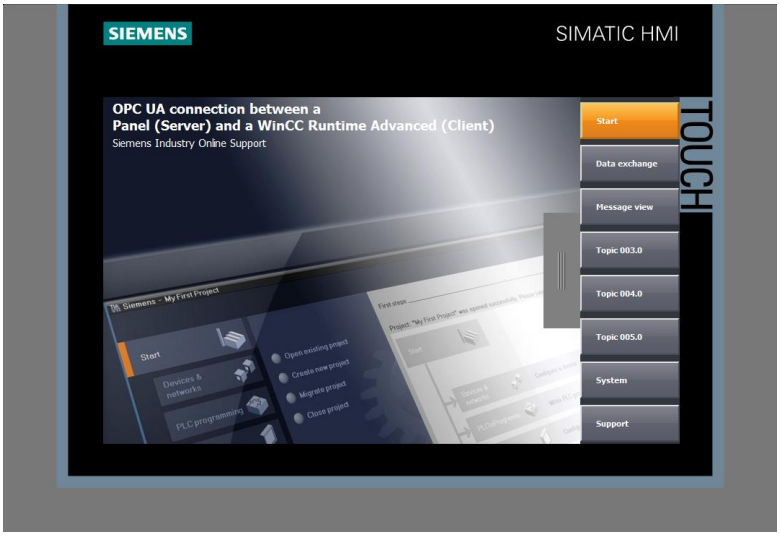
The application example shows how communication works between a Comfort Panel and a WinCC Runtime Advanced station via an OPC UA connection.

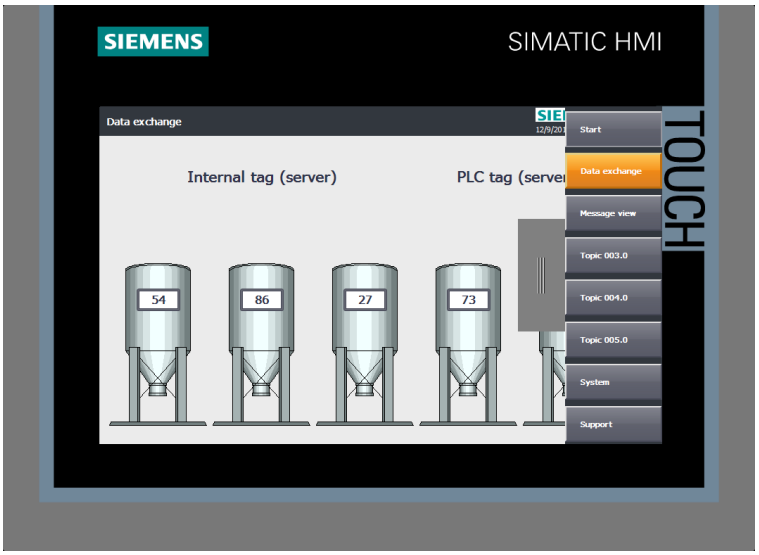
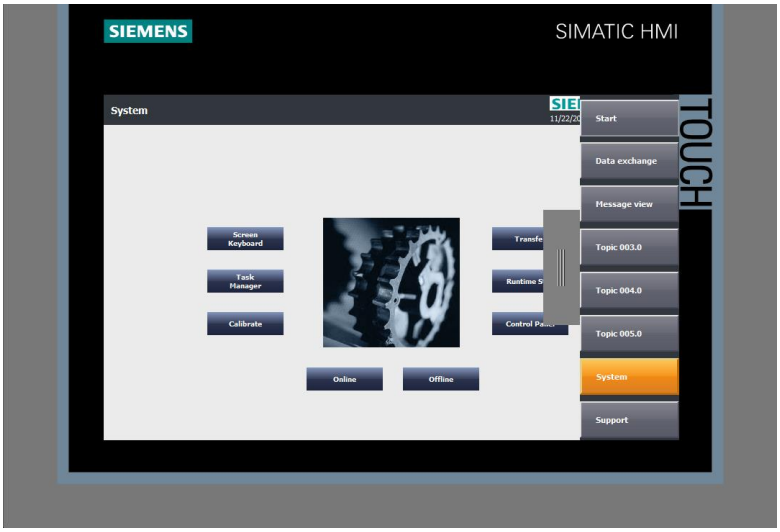
Overview and description of the Comfort Panel user interface

The following sections provide a brief description of the three most important screens:

- Start screen
- Data exchange
- System screen

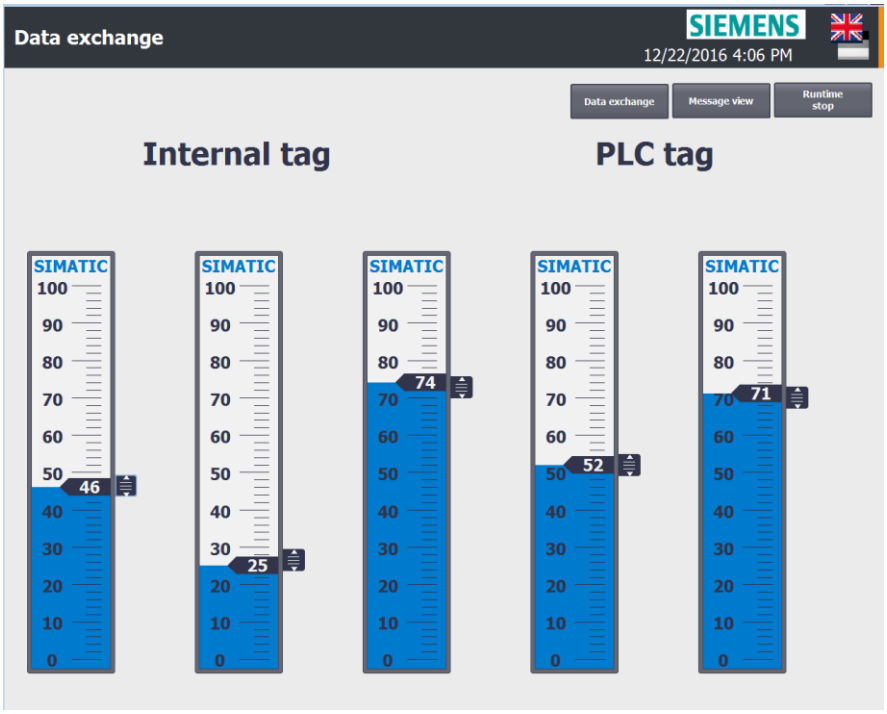
Table 5-1

No.	Action
1.	**Start screen** • After starting the Comfort Panel runtime, the following screen opens. • To navigate through the project, open the right-hand "slide-in screen". 

No.	Action
2.	**Data exchange (TP900 Comfort Panel)** • Click the "Data exchange” button. The screen allows you to test communication between the Comfort Panel and the WinCC Runtime Advanced station. • The simulated process values of the T900 Comfort Panel are read via the OPC UA interface of the PC station. 
3.	**System screen** • Click the "System” button. The screen allows you to execute the system functions shown on the screen, for example "Runtime Stop”. 
4.	**Other screens** The "Message view” screen is used to open the message history. The "Support” screen provides you with related online support information.

Overview and description of the WinCC Runtime Advanced station user interface

Table 5-2

No.	Action
1.	**Start screen** • Starting the runtime opens the following screen on the PC station. To simulate process values, you can specify values using the sliders. • The buttons allow you to open the displayed screens / execute the system functions. 

6 Appendix

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6.2 Related literature

Table 6-1

	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	https://support.industry.siemens.com/cs/ww/en/view/63481236

6.3 History

Table 6-2

Version	Date	Modifications
V1.0	04/2017	First version